

Discussion

The USPTO rejected Claims 1 - 10 under 35 USC § 102, as being anticipated by Shikada, et. al., U.S. Patent No. 6,147,125 ("Shikada, et. al."). The USPTO also rejected Claims 11 - 21 under 35 USC § 103 as being unpatentable over Shikada, et. al. as applied to Claims 1 - 10. The applicants respectfully traverse each of these rejections.

The applicants have discovered a new and useful process for the production of a water gas shift catalyst. While water gas shift catalysts of both the prior art and the invention contain copper oxide, zinc oxide and aluminum oxide, the prior art teaches that the preferred water gas shift catalyst comprising copper, zinc and aluminum oxide was prepared from a catalyst precursor with the highest possible hydrotalcite content. (See page 5, lines 1 - 16 of the application.) In contrast, the applicants have surprisingly discovered that an improved water gas shift catalyst containing copper, zinc and aluminum is prepared when only 1% to about 60% of the aluminum is present in the catalyst precursor in the form of hydrotalcite. Evidence of the superior performance of the applicants' catalysts is clearly shown on Table 1, page 25 of the application, wherein catalysts with a catalyst precursor containing a hydrotalcite percentage from 1 to 60% preformed better than catalysts prepared by the process of the prior art

where the percentage of hydrotalcite present in the catalyst precursor exceeded 70%. The USPTO acknowledged that this composition was novel when it allowed the parent application to issue as U.S. Patent No. 6,693,057. (See also the related patent U.S. Patent No. 6,627,572.)

In contrast, the USPTO rejected all claims of the current application for a process for producing the patented catalyst composition, citing Shikada, et. al. The USPTO asserts on page 2 of the Office Action that Shikada, et. al. "discloses a process for preparation of a catalyst useful as a water gas shift catalyst and a methanol synthesis compound (column 2, lines 30 - 68)." Careful review of the cited portion of Shikada, et. al. discloses no teaching of any process for the production of a water gas shift catalyst, but rather only a disclosure of a process for production of a "catalyst suitable for producing dimethyl ether..." (col. 2, lines 29 - 30.) Conventional dimethyl ether synthesis requires use of the processes of methanol synthesis followed by methanol dehydration. The process of Shikada, et. al. produces this bi-functional catalyst by first preparing alumina particles and then placing around those particles "a layer comprising a methanol synthesis catalyst..." col. 2, line 38. The catalyst produced by the process disclosed in Shikada, et. al. is not a water gas shift catalyst, but rather merely a catalyst designed

for producing dimethyl ether. Accordingly, the applicants respectfully asserts that Shikada, et. al. do not disclose nor suggest any process for a water gas shift reaction.

In addition, the process disclosed by Shikada, et. al. could never produce the catalyst that is produced by the process of the application. As stated above, dimethyl ether synthesis requires methanol synthesis followed by methanol dehydration. The methanol dehydration reaction taught by Shikada, et. al. requires production of a catalyst possessing a high concentration of acidic sites. It is well known in the literature that alumina contains high levels of desirable acid sites, if it is specially processed. To produce these acid sites, it is necessary that the alumina be treated with a strong acid. This process of acid treatment is required by Shikada, et. al. As stated at col. 2, lines 57 - 58 of Shikada, et. al., the alumina particles, which are part of the Shikada, et. al. dimethyl ether catalyst, are washed "with an acid aqueous solution." The necessity for this acid wash is discussed in detail at col. 7, lines 18 - 46 of Shikada, et. al., where they state that

...methanol which is generated on the methanol synthesis catalyst migrates onto the alumina which is a methanol-dehydration catalyst, where the methanol undergoes dehydration and condensation by the action of acid active centers on the alumina to yield dimethyl ether, which mechanism is described

later. (Emphasis supplied) (Shikada, et. al., Col. 7, lines 24 - 29.)

Shikada, et. al. further teach that

[t]o recover an acid active centers on alumina, the method for manufacturing catalyst according to the present invention involves washing the alumina particles with an acid aqueous solution after forming the above-described deposit. For washing, the alumina particles may be suspended in an acid aqueous solution. (Emphasis supplied) (Shikada, et. al. Col. 7, lines 31 - 37.)

Further evidence of the necessity of this acid treatment is contained in the Examples of Shikada, et. al. See Examples 1 and 5 through 8 at col. 9, lines 63 - 66 and Example 2 at col. 10, lines 24- 29, each of which discloses the use of an acid wash.

It is clear that the process taught by the application is entirely different as it does not utilize this acid washing. (See each Example.) The reason that this acid washing is not utilized in the applicants' process is that such acid washing would entirely destroy the hydrotalcite structure. While lower levels of hydrotalcite in the water gas shift catalyst of the invention in the range of 1 to 60% are preferred, total elimination of the hydrotalcite is not preferred. Note in the application that the range of the hydrotalcite is 1 to 60% with a preferred range from 5 to 45%, and a more preferred range from 10 to 45%. (Page 8, lines 23 -

25.) See also the level of hydrotalcite present in each of the Examples, as shown in Table 1 on page 25.

Thus, the goal of Shikada, et. al. is to produce alumina with acid sites to promote the methanol synthesis and methanol dehydration reactions. This is entirely different from the goal of the application to produce a water gas shift reaction catalyst with low levels of hydrotalcite. The acid washing step of Shikada, et. al. would have destroyed any hydrotalcite, thus destroying the functionality of the catalysts for a water gas shift reaction.

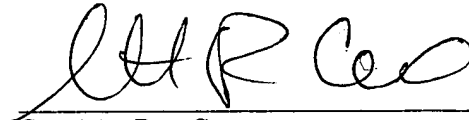
Accordingly, the process taught by Shikada, et. al. is entirely different from the process that is claimed by the applicants. Not only is a different composition of the catalyst produced by the Shikada, et. al. process, but a different function for that catalyst exists. The process of Shikada, et. al. produces a catalyst for the synthesis of dimethyl ether. In contrast, the catalysts of the applicants' process are used for a water gas shift reaction.

The applicants respectfully assert that these distinctions are sufficient to distinguish the process taught by Shikada, et. al. from the processes claimed in the application.

CONCLUSION

The applicants request that this Amendment and the arguments made therein be considered and that a Notice of Allowance be issued. If there are any questions concerning this Amendment, please contact applicants' counsel.

Respectfully submitted,



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